Mounting of rolling bearings
Hydraulic mounting

Mounting methods

Mounting

Due to the different types and sizes of rolling bearings, they cannot all be mounted using the same method. A distinction is made between mechanical, hydraulic and thermal methods.

In the mounting of non-separable bearings, *Figure 1*, the mounting forces must always be applied to the ring with a tight fit. Any forces applied to the ring with a loose fit would be transmitted by the rolling elements, which could cause damage to the raceways and rolling elements. Heating of the housing causes expansion of the bearing seat and thus makes the mounting process considerably easier.

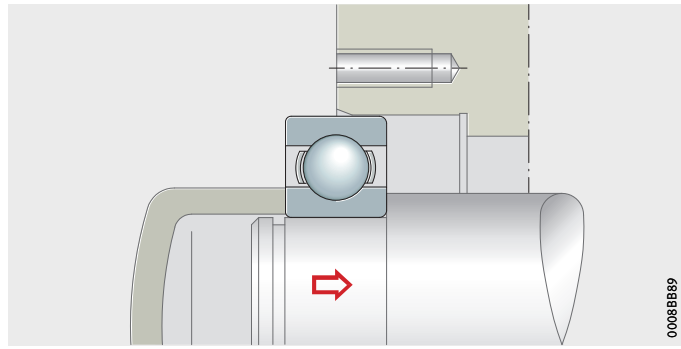


Figure 1
Mounting
of a non-separable bearing

In the case of separable bearings, *Figure 2*, mounting is simpler; both rings can be mounted individually. Rotating the ring during mounting gives a screwdriver effect that will help to avoid scraping marks.

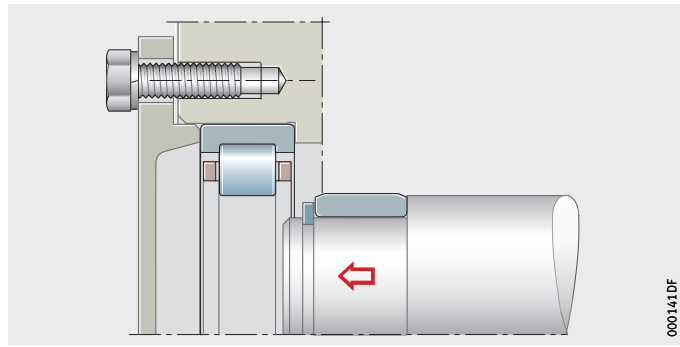


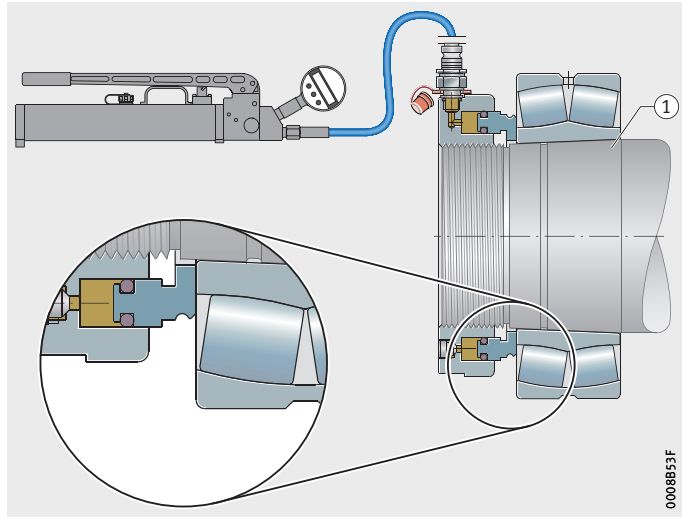
Figure 2
Mounting
of a separable bearing

Hydraulic mounting

Hydraulic tools can be used to apply large forces. These methods are therefore particularly suitable for the mounting of large bearings with a tapered bore. Hydraulic nuts are used as a mounting tool. Pressure can be generated using oil injectors, hand pumps or hydraulic units.

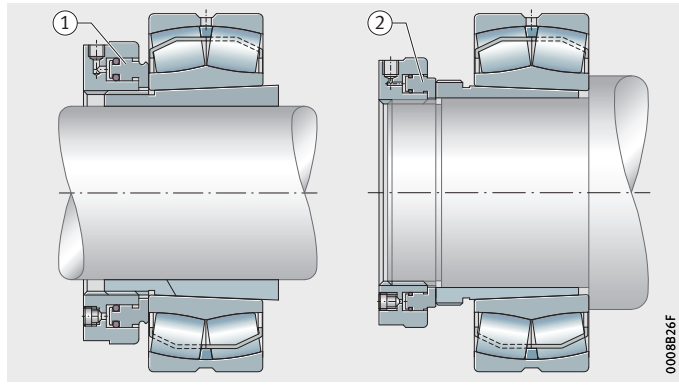
Hydraulic nuts

Hydraulic nuts are used to press components with a tapered bore onto their tapered seat, *Figure 3* and *Figure 4*. These tools are mainly used if the drive-up forces required cannot be applied using other accessories, e.g. shaft nuts or pressure screws. Hydraulic nuts comprise a press ring and an annular piston. Depending on size, the nut thread is a metric precision thread or a trapezoidal thread. Inch size designs are also available. The oil connector, irrespective of size, is always designed as $G^{1}/_{4}$.



① Mounting on a tapered seat

Figure 3
Mounting of a spherical roller bearing using a hydraulic nut



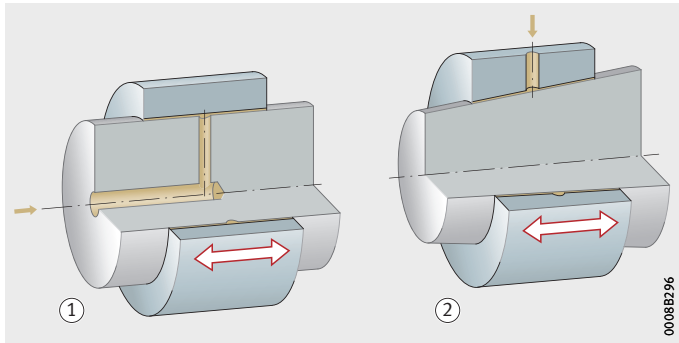
① Pressing into place on an adapter sleeve
② Presing-in of a withdrawal sleeve

Figure 4
Mounting of a spherical roller bearing using a hydraulic nut

Mounting methods

Oil pressure method

In the oil pressure method, oil is pressed between the fit surfaces, *Figure 5*. This method is particularly suitable for the mounting of large bearings with a tapered bore on a conical shaft or on an adapter or withdrawal sleeve. The oil film substantially neutralises the contact between the fit parts, so they can be displaced relative to each other with the application of little force and without the risk of surface damage. Fretting corrosion is loosened by means of paraffin or rust-dissolving additives in the oil.



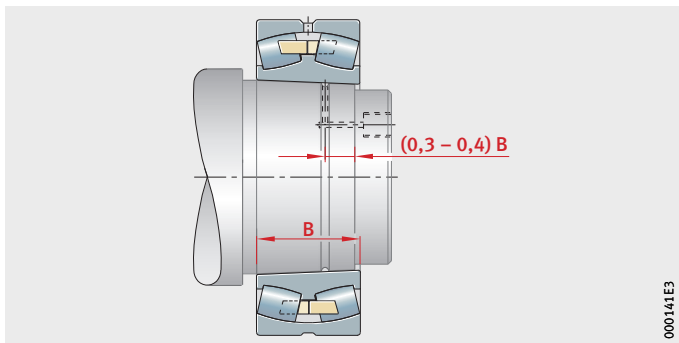
① Cylindrical seating surface
② Tapered seating surface

Figure 5
Principle of hydraulic mounting: creation of a fluid film between the fit surfaces

In both cases, oil grooves and feed ducts as well as threaded connectors for the pressure generation devices must be provided. The width of the oil groove is dependent on the bearing width, *Figure 6*. Further design guidelines are given in the FAG publication WL 80102, Hydraulic Method for the Mounting and Dismounting of Rolling Bearings. Hydraulic nuts are used as a mounting tool. Pressure can be generated using hand pumps and hydraulic units. In isolated cases, oil injectors can also be used.

A mounting plate prevents damage to the sleeve or bearing ring. When pressing in the withdrawal sleeve, *Figure 8*, page 5, the oil connector is guided by the shaft nut. The drive-up distance of the bearing or withdrawal sleeve is determined in accordance with the necessary reduction in radial internal clearance. In order to measure the radial internal clearance, the bearing must be disconnected from the oil pressure.

Once the oil pressure has been disconnected, it will take between 10 minutes and 30 minutes until the oil has completely escaped from the fit joint. During this time, the axial preload must continue to act. After this point, the mounting device (nut with pressure screws or hydraulic nut) is removed and the shaft or sleeve nut is screwed into place and secured.



B = bearing width

Figure 6
Recommended width for oil grooves

Tapered shaft

If the bearing is seated directly on a tapered shaft, the oil is pressed between the fit surfaces, while the bearing is simultaneously pressed onto the taper by means of screws or a nut. The reduction in radial internal clearance or the axial drive-up distance is measured at this time, *Figure 7*.

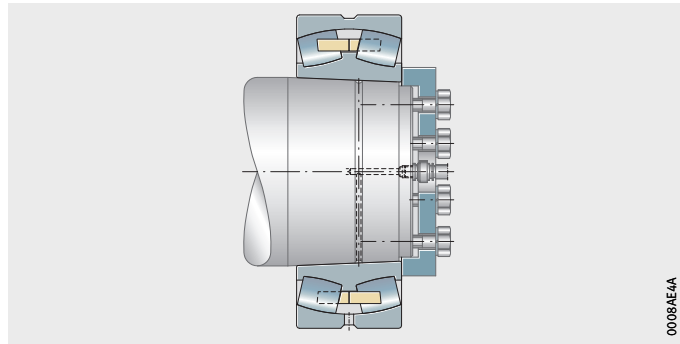


Figure 7
Bearing seat
on the shaft

Withdrawal sleeve

If the bearing is seated on the withdrawal sleeve, the oil is pressed between the fit surfaces, while the withdrawal sleeve is pressed into the bearing bore by means of screws or a nut. The oil is fed through the shaft nut. The reduction in radial internal clearance is measured at this time, *Figure 8*.

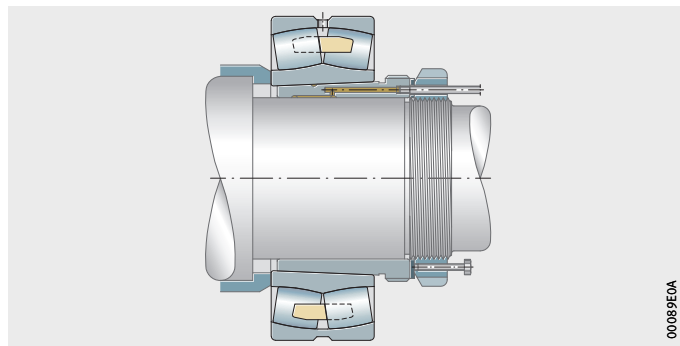
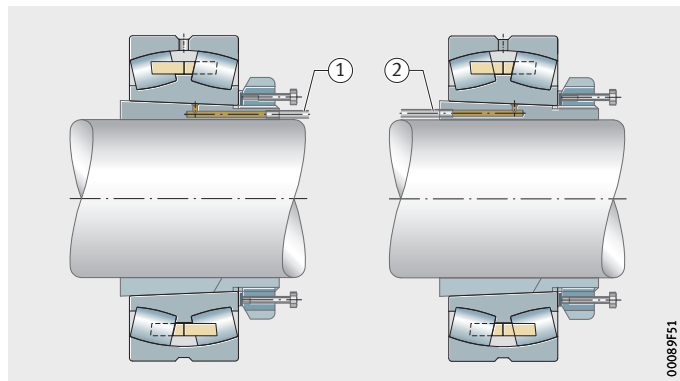


Figure 8
Bearing seat
on the withdrawal sleeve

Adapter sleeve

If the bearing is seated on the adapter sleeve, the oil is pressed between the fit surfaces, while the bearing is pressed onto the adapter sleeve by means of screws or a nut. The reduction in radial internal clearance is measured at this time, *Figure 9*.



① Oil connector on threaded side
② Oil connector on taper side

Figure 9
Bearing seat
on the adapter sleeve

Oil injector

In the mounting of bearings with a tapered bore that are seated directly on the tapered journal, the oil pressure method requires only a small quantity of oil. In this case, simple injectors with a small delivery rate are sufficient, *Figure 10*. Injectors are available from Schaeffler in two sizes with threaded connectors $G^3/_8$ and $G^3/_4$. The smaller oil injector can be used for shaft diameters up to 80 mm, while the larger injector can be used for shaft diameters up to 150 mm.

Figure 10
Oil injectors

Hand pump

In the case of cylindrical fit surfaces and when using adapter and withdrawal sleeves, the oil loss occurring at the edges of the fit surfaces requires a greater oil delivery, so a pump must be used, *Figure 11*.

A machine oil of moderate viscosity can be used as a pressure fluid. For mounting, it is recommended that the oil should be as thin as possible with a viscosity of ≈ 75 mm^2/s at +20 °C (nominal viscosity 32 mm^2/s at +40 °C), in order that the oil can escape without residue from the fit joint after mounting.

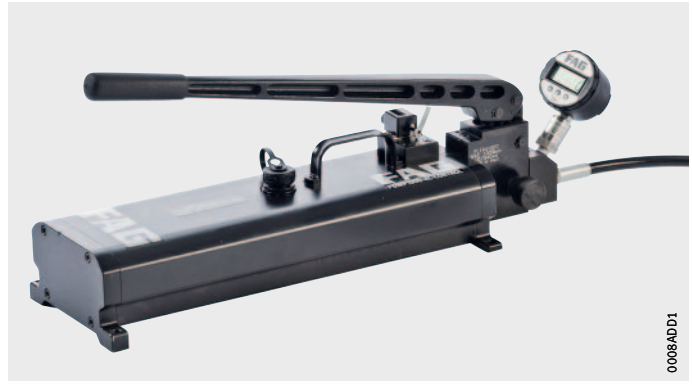


Figure 11
FAG hand pump set

Further information

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